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(54)[Title of the Invention]
High strength waterproof canvas

Specification
1.
Title of the Invention
High strength waterproof canvas

2.
CLAIMS
High strength waterproof canvas characterized by waterproofing [using the synthetic fiber which consists of a flexible macromolecule chain which has the tensile strength of at least 15g/denier, and a modulus of elasticity in tension of at least 300g/denier as a principal component].

2.
With a waterproof-canvas width of 3cm tensile strength TS[(KG)/(g/m^2) to per [the unit eyes (g/m^2) of the cloth which constitutes the waterproof canvas]] is the high strength waterproof canvas given in the 1th term of a claim which is two or more preferably 1.5 or more.

3.
In the rate of flat-izing of 1.7 or more, the cross section of the synthetic fiber used as a principal component is the high strength waterproof canvas given in either of the 1st term of a claim or the 2nd term which is three or more preferably.

4.
High strength waterproof canvas given in either [which has a longwise multi-groove where the synthetic fiber used as a principal component is countless on the surface] the 1st term of a claim, or the 3rd term.

5.
High strength waterproof canvas given in either of the 1st term of a claim or the 4th term which the synthetic fiber used as a principal component becomes from high-molecular weight polyethylene.

DETAILED DESCRIPTION
The present invention relates to the waterproof canvas, especially the waterproof canvas which has high strength though it is lightweight.

Generally the waterproof canvas used for tentorium, an air dome, flexible freight containers, a simple combustion boat . life raft, sail cloth, car seats, etc. The raw material waterproofed with a vinyl chloride resin, chlorosulfonated polyethylene resin, etc. is used for continuous glass fiber fabrics, such as staple fiber fabrics, such as cotton, vinylon, and polyester, or vinylon, polyester, and nylon. As for these waterproof canvas, the drag to fracture by external force, especially high tensile strength, is required on the characteristic of the application. Therefore, the yarn formation material which becomes a base fabric of these waterproof canvas from powerful high fiber is chosen, and using the fabric which carried out the product made from this thread raw material by high density is known.

However, as long as conventional general-purpose fiber was used, in order to have obtained the base fabric of the waterproof canvas which is in the tensile strength of fiber, or has high sthenic since it is 9.5~10g/denier, it was the only means to make the eyes of a base fabric high for weave density highly conventionally. Since it was bulky while waterproof-canvas weight increases, when based on this means, when handling nature became difficult and used it for tentorium, an air dome, etc., only the sthenic supporting tare of these waterproof canvas was required of the pillar, and pillars, such as a thick pipe, were required for it.

Very much, aromatic polyamide system fiber and aromatic polyester system fiber which have high strength of 20g/denier or more are developed, and especially aromatic polyamide fiber is examined by the waterproof canvas recently. However, although this kind of fiber is high strength, since the raw material cost is higher than the molecular structure of a polymer, cost should become high. Since fiber is colored brown from yellow, be inferior to coloring nature. Ductility be low inferior to shock resistance. There are problems, like weather resistance is bad. Furthermore, in the case of manufacture, in order to adopt wet spinning, it is a problem of a rate of solidification, and the actual condition is that it is remarkably difficult for single fiber to obtain yarn of 2 deniers or more.

In view of such the actual condition, these inventors that the defect of the conventional waterproof canvas described above should be canceled The high strength which consists of flexible macromolecules, such as polyethylene obtained by patent application No. 152261, Showa 58 patent application No. 154622, Showa 58 patent application No. 161044, etc. by the procedure of a statement in Showa 58, as a result of repeating analyses wholeheartedly, It found out that the high strength waterproof canvas which solves all the defects of the conventional waterproof canvas which describes above the rate synthetic fiber of high elasticity by using as principal component raw thread of the base fabric of the waterproof canvas was obtained, and the present invention was reached.

That is, the present invention is high strength waterproof canvas characterized by waterproofing [using the synthetic fiber which serves as tensile strength of at least 15g/denier from the flexible macromolecule chain which has a modulus of elasticity in tension of at least 300g/denier as a principal component].

In spite of being lightweight compared with the high strength waterproof canvas told to the present invention to the conventional waterproof canvas, the waterproof canvas which has high tensile strength is said. If this is expressed with TS [3cm tensile strength (kg) in width of the waterproof canvas to per [the unit eyes (g/m^2) of the cloth which constitutes the base fabric of the waterproof canvas]] (TS is proved below) TS value of the waterproof canvas of the present invention is preferably shown more than 1.5 [(kg) /(g/m^2)] above 2 [(kg)/(g/m^2)].

if TS value incidentally shows the strength of the waterproof canvas using the conventional high strength polyester thread -- at most -- it is 0.9.

The molecular chain which the flexible molecular chain told to the present invention is a molecular chain which consists of molecular binding which may be rotated when a stress and heat are received, and constitutes all the aromatic series polyamide, all the aromatic series polyester, etc. is not contained in this. The synthetic fiber which consists of a flexible macromolecule chain in the present invention is not limited to this etc., although polyolefines, such as polyethylene of the amount of macromolecules and polypropylene, polyacrylonitrile, poly(fluoridation) vinylidene, etc. are mentioned, for example.

The synthetic fiber used as the principal component which constitutes the waterproof canvas of the present invention is [the tensile strength of 25g/denier or more, and] 500g/denier or more especially preferably 300g/denier or more 20g/denier or more preferably 15g/denier or more. It has a modulus of elasticity in tension of 800g/denier or more especially. Here, if it is when tensile strength is less than 15g/denier fiber, the waterproof canvas of the high strength made into the object of the present invention is not obtained. The waterproof canvas Moreover, tentorium, an air dome, flexible freight containers, a simple combustion boat, When it is used for various kinds of applications, such as a life raft, in order to make low elongation of the waterproof canvas at the time of extension as much as possible at the time of a load It is required to make especially desirable 300g/denier or more of moduli of elasticity in tension [500g/denier or more of] of this fiber more than in 800g//[a denier and]. If it is when a modulus of elasticity in tension is less than 300g/denier here, since a base fabric is elongated by slight external force and too much stress is impressed to a coating material by it, the problem that a pinhole etc. occurs is produced. Moreover, in order to avoid such a problem, thickness of a coating material must be thickened too much, and it becomes difficult to attain weight saving of the waterproof canvas made into the object after all, and is not desirable.

As for especially the synthetic fiber used as the principal component which furthermore constitutes the waterproof canvas of the present invention, it is desirable that the rate of applanatio of a cross section has three or more 1.7 or more, when it is considered as the waterproof canvas, the outstanding plasticity is given and handling nature becomes good.

Measuring major axis length (amm) and the die length (bmm) of a brachydiagonal on the cross section where the rate of flat-izing said here is right-angled to a fiber axis, the rate of flat-izing is a value shown by a/b.

By giving a longwise countless multi-groove to the surface of the synthetic fiber used as the principal component which constitutes the waterproof canvas of the present invention, these inventors have also proved that the adhesive property to the base fabric of a coating material improves in waterproofing mentioned later.

The multi-groove said here is a countless *multi-groove* arranged in the direction of a fiber axis, and two or more effects per mean distance 10u of the peripheral direction of the cross section of fiber described above become remarkable by having arranged five to 50 pieces especially as this multi-groove.

Fiber used as the principal component which constitutes the high strength waterproof canvas of the present invention 15g/denier or more In order to fill 20g/denier or more of moduli of

elasticity in tension [300g/denier or more of / 500g/denier or more of] of 800g/denier or more especially preferably especially with the tensile strength of 25g/denier or more preferably, it is required for molecular weight to choose a crystalline good high polymer. The original color of this fiber is colorlessness or white. Dyeing according to an application or liking is possible. It can be considered as the good color of coloring nature also by the arrival at a field. Moreover, which gestalten, such as multifilament, a monofilament, and spun yarn, may be sufficient as the gestalt of fiber.

The waterproof canvas of the present invention is desirable in containing especially 75% of the weight or more at least 50% of the weight in the waterproof canvas with which fiber used as the principal component which constitutes the waterproof canvas is constituted. If it is when the content in the waterproof canvas of the fiber which serves as a principal component here is less than 50 % of the weight, since the high strength waterproof canvas made into the object by the present invention becomes difficult to get, it is not desirable.

The high strength waterproof canvas of the present invention does not bar mixing one or more sorts of other fiber, and constituting the waterproof canvas, of course, when the number of fiber used as the principal component of the raw thread which constitutes the waterproof canvas is one.

The waterproof canvas of the present invention is polyethylene (for example, in more than $1x10^5$, a weight average molecular weight) of the amount of macromolecules, for example. Ultra high molecular weight polyethylene more than $1x10^5$ is used preferably. It is [fiber / which was manufactured by this solution spinning / which carried out solution spinning / gel] higher than the dissolving point of a rated supply fiber in stretching-zones inlet-port temperature. Consider it as temperature lower than the melting point of this rated supply fiber, and it is higher than the melting point of this feed fiber in stretching-zones outlet temperature. The high strength and rate fiber of high elasticity which have a flexible macromolecule chain obtained by the novel high magnification drawing procedure of carrying out a multistage drawing while passing the stretching zones made into temperature lower than the melting point of an after-drawing fiber are used as raw thread material. It can manufacture easily by this considering it as Cloth and waterproofing.

Cloth told to the present invention serves as a base fabric which constitutes the waterproof canvas. What kind of things, such as textile fabrics, a nonwoven fabric, a decussation arrangement type nonwoven fabric may be sufficient as the gestalt. It is the fitness which is preferably constituted considering textile fabrics especially a plain weave, twill, satin, etc. as a histogen.

Moreover, although waterproofing told to the present invention says water proof (imperviousness) processing generally performed conventionally and being carried out to Cloth which serves as a base fabric, for example by coating synthetic resins, such as vinyl resin and urethane system resin, a drying oil, rubber, and waxes As long as it is the waterproofing procedure which does not spoil the original characteristic of a base fabric it is light, strong and flexible, you may be what kind of procedure. If it is when a base fabric consists of synthetic fibers with a comparatively low melting point, such as polyethylene, here, it is desirable to choose coating materials, such as chlorosulfonated polyethylene resin, ethylene vinyl acetate copolymer resin, etc.

It is also more desirable to use a flame retardant material for a coating material, of course, and to perform fire-resistant processing simultaneously.

According to the present invention, compared with the conventional waterproof canvas, though it is very lightweight, the waterproof canvas excellent in high strength and waterproofness-proof is obtained.

The high strength waterproof canvas of the present invention is cheap compared with the waterproof canvas which consists of conventional aromatic polyamide system fiber, and it excels in weather resistance and a color tone, and in spite of being weight saving compared with the waterproof canvas of the general former, it has high strength. That is, 3cm in width of per an unit eye (g/m^2) of the base fabric which constitutes the waterproof canvas is very large, and cancellation powerful (kg)] value TS excels [width] in waterproofness-proof further.

Since the high strength waterproof canvas of the present invention has the above-mentioned description, it is lightweight, the flexibility to the waterproof-canvas application expected high strength and waterproofness-proof is high, and the technical meaning has a very large thing.

If it is a waterproof-canvas application expected high strength and waterproofness-proof by weight saving as an application of the high strength waterproof canvas of the present invention, it is applicable to any applications, but For example, although tentorium, an air dome, flexible freight containers, a simple combustion boat, a life raft, a raft, sail cloth, car seats, a hood, etc. are mentioned, of course, it does not limit to these.

The measuring method of physical properties used for assessment of the present invention is based on below.

<The measuring method of the strong ductility characteristics of fiber>
Using Oriental Baldwin tensilon, the s-s curve of single fiber was measured on condition of for 30mm of sample length (gage length), and 100% of rate-of-extension/, and tensile strength (g/d) and an initial modulus (g/d) were computed. The initial modulus was computed from the maximum inclination near the origin/datum of a s-S curve. Each characteristics were made into the average of what was measured about 20 single fiber.

<Measurement of mass per unit area of cloth>
It applies to the procedure of 6-4-2 specified to JIS-LI096 (1979).

<Measurement of the tensile strength of cloth>
It applies to 6, 12, 1, and the A method specified to JiS-LI096 (1979).
However, the width of a specimen adopts 3cm.

Although the present invention is explained in full detail according to an execution example below, the present invention is not limited to these execution examples from the first.

Execution example 1.

A weight average molecular weight carries out melt spinning using the ultra high molecular weight polyethylene which has a flexible macromolecule chain of $1.9x10^6$. The high

magnification drawing of the obtained gel fiber was carried out in many stages, and the high strength polyethylene fiber which has a countless multi-groove on the fiber surface at tensile strength 36 g/d, modulus-of-elasticity-in-tension 1000/d, the fineness of 1000d, and the rate 5.3 of cross-sectional applanatio was obtained. The fabric shown in the 1st table was created using the multifilament of this fiber, it waterproofed by having used ethylene vinyl acetate copolymer resin for this fabric as a coating material, the waterproof canvas was created, and this was set to experiment No.1.

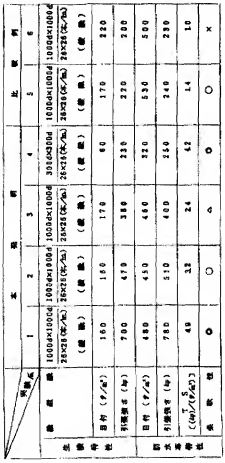
Next, the high magnification drawing of the gel fiber obtained by carrying out solution spinning was carried out in many stages using polyethylene of experiment No.1 and the amount of isomerism children, and the polyethylene fiber of the tensile strength of 25g/d, modulus-of-elasticity-in-tension 660 g/d, and the with a fineness [1000d] rate 2.8 of cross-sectional applanatio was obtained. The fabric shown in the 1st table was created using the multifilament of this fiber, it waterproofed by having used ethylene vinyl acetate copolymer resin for this fabric as a coating material, the waterproof canvas was created, and this was set to experiment NO.2. Furthermore, the high magnification drawing of the gel fiber obtained by carrying out solution spinning to experiment NO.1 using the polyethylene which has the amount of isomerism children was carried out in many stages, and the polyethylene fiber of the tensile strength 22 g/d. modulus of elasticity in tension of 480g/d and the rate 1.5 of cross-sectional applanatio with a fineness of 1000d was obtained. The fabric shown in the 1st table was created using the multifilament of this fiber, it waterproofed by having used ethylene vinyl acetate copolymer resin for this fabric as a coating material, the waterproof canvas was created, and this was set to experiment NO.3.
Subsequently, the high magnification drawing of the gel fiber obtained by carrying out solution spinning to experiment NO.1 using the polyethylene which has the amount of isomerism children was carried out in many stages, and the polyethylene fiber of tensile strength 40 g/d, modulus-of-elasticity-in-tension 1300 g/d, and the rate 5.6 of cross-sectional applanatio with a fineness of 300d was obtained. The fabric shown in the 1st table was created using the multifilament of this fiber, it waterproofed by having used ethylene vinyl acetate copolymer resin for this fabric as a coating material, the waterproof canvas was created, and this was set to experiment NO.4.

The gel fiber obtained by furthermore carrying out solution spinning to experiment NO.1 using the polyethylene which has the amount of isomerism children as a comparison example of the present invention was extended, and the polyethylene fiber of tensile strength 14 g/d, modulus-of-elasticity-in-tension 180 g/d, and the with a fineness [1000d] rate 3.2 of cross-sectional applanatio was obtained. The fabric shown in the 1st table was created using the multifilament of this fiber, it waterproofed by having used ethylene vinyl acetate copolymer resin for this fabric as a coating material, the waterproof canvas was created, and this was set to experiment NO.5.

Tensile strength 8.5 g/d of marketing for a comparison, modulus-of-elasticity-in-tension 95 g/d, The fabric shown in the 1st table was created using circular 1000d polyester multifilament, and the fiber cross section waterproofed by having used ethylene vinyl acetate copolymer resin for this fabric as a coating material, created the waterproof canvas, and set this to experiment NO.6.

The characteristics of each gray fabric and the characteristics of the waterproof canvas are shown in the 1st table.

表 1 表



Though it is a high strong mosquito, it turns out that the high strength waterproof canvas of the present invention is very lightweight, so that clearly from the 1st table.

In the present invention (experiment NO.4), the tensile strength of the waterproof canvas 250kg and a comparison example (experiment NO.6) so that clearly, if experiment NO.4 of the present invention is compared with experiment NO.6 which are the conventional examples of the waterproof canvas Moreover, 230kg, When obtaining the waterproof canvas which is about 4 times the value of this, and has an ordinary strong mosquito conventionally when TS value is this invention [experiment NO.4, in spite of having the sthenic approximated mostly, it turns out that a weight saving is very possible.

Furthermore, it turns out that high strength and a weight saving are not attained but the waterproof canvas in case the tensile strength shown by experiment NO.5 (comparison example) and the fiber used for the raw thread for fabrics which constitutes the waterproof canvas, and a modulus of elasticity in tension do not fill the present invention becomes as low [TS value] as 1.4.

Applicant-for-a-patent Toyobo Co., Ltd.

Procedure amendment <<spontaneity
(1)
detailed -- the 1st page "major axis length" of the 4th line -- "the die length of a macro axis" -- correction.
(2)
"Melt spinning" of 12th page description [18 to 16th line] is corrected to "solution spinning."